C A M O S U N C O L L E G E

PHYSICS DEPARTMENT

PHYS 115 FUNDAMENTALS OF PHYSICS 2

A continuation of the survey of topics begun in PHYS 114 with increased use of calculus. Skills and knowledge about Physics will be expanded through investigation of mechanical energy and linear momentum, electrostatics, electric circuits, electromagnetism, rotational dynamics, periodic motion, and physical optics. PHYS114 and 115 is intended to satisfy the first year requirement for students pursuing studies in the physical sciences.

OFFERED:	Winter, Spring
CREDIT:	4
IN-CLASS WORKLOAD:	4 lecture, 2 lab
OUT-OF-CLASS WORKLOAD:	6
PREREQUISITES:	PHYS 114 and MATH 100
COREQUISITES:	MATH 101 and MATH 235A

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1. **Mechanical energy**

   1.1 Work
   - 1.1.1 By a constant force
   - 1.1.2 By a varying force

   1.2 Kinetic energy
   - 1.2.1 Work-energy theorem
   - 1.2.2 Concept of net work

   1.3 Potential energy
   - 1.3.1 Conservative forces
   - 1.3.2 Potential energy
   - 1.3.3 Gravitational potential energy
   - 1.3.4 Elastic potential energy
   - 1.3.5 Potential energy functions

   1.4 Conservation of energy
   - 1.4.1 Work-energy theorem
   - 1.4.2 Conservation of mechanical energy
   - 1.4.3 Effect of non-conservative forces
   - 1.4.4 Conservation of energy in general
   - 1.4.5 Mass-energy equivalence

2. **Linear momentum**

   2.1 Momentum and impulse
   - 2.1.1 Concept of momentum
   - 2.1.2 Concept of impulse

2.1.3 Newton's second law revisited
2.1.4 Variable force

2.2 Momentum during interactions
2.2.1 Conservation of linear momentum
2.2.2 Elastic collision
2.2.3 Inelastic collision

2.2.4 Coefficient of restitution
2.2.5 Two dimensional interactions

2.3 Motion of system of particles
2.3.1 Concept of center of mass
2.3.2 Determination of center of mass
2.3.3 Dynamics of systems
2.3.4 Variable mass and rocket propulsion

3. **Electrostatics**

3.1 Electric charges
3.1.1 Types
` 3.1.2 First law of electrostatics
3.1.3 Conductors and insulators
3.1.4 Coulomb's law

3.2 Electric field
3.2.1 Due to point charges
3.2.2 Vector nature
3.2.3 Electric field lines
3.2.4 Effect on charges

3.3 Electric potential
3.3.1 Electric potential energy
3.3.2 Potential difference
3.3.3 Equipotential surface
3.3.4 In a uniform field
3.3.5 Near point charge

4. **Electric Circuits**

4.1 Parts of a circuit
4.1.1 Source of energy
4.1.3 Types of loads
4.1.4 Conducting path
4.1.5 Electric current

4.2 Resistance
4.2.1 Ohm's law
4.2.2 Resistivity
4.2.3 Temperature dependence

4.2.4 Superconductors

4.3 Sources of energy
- 4.3.1 Types
- 4.3.2 Electromotive force
- 4.3.3 Internal resistance

4.4 Series circuits
- 4.4.1 Description
- 4.4.2 Characteristics

4.5 Parallel circuits
- 4.5.1 Description
- 4.5.2 Characteristics

4.6 Series parallel circuits

4.7 Kirchhoff's rules
- 4.7.1 Junction (current) rule
- 4.7.2 Loop (voltage) rule

5. **Magnetic fields**

5.1 Magnetic force on a charge
- 5.1.1 Characteristics
- 5.1.2 Magnetic flux density

5.2 Magnetic force on a conductor
- 5.2.1 Due to a uniform field
- 5.2.2 Torque on a loop

5.3 Motion of charge in a magnetic field
- 5.3.1 Description
- 5.3.2 Cyclotron
- 5.3.3 Mass spectrograph
- 5.3.4 Velocity selector
- 5.3.5 Hall effect

5.4 Sources of magnetic fields
- 5.4.1 Biot-Savart law
  - 5.4.1.1 Thin straight conductor
  - 5.4.1.2 Current loop
  - 5.4.1.3 Solenoid
- 5.4.2 Atomic magnetism

6. **Rotational motion**

6.1 Kinematics
- 6.1.1 Angular displacement

6.1.2 Angular velocity
6.1.3 Angular acceleration
6.1.4 Kinematics equations
6.1.5 Relationship between linear and angular

6.2 Dynamics
6.2.1 Torque
6.2.2 Newton's second law for rotation
6.2.3 Moment of inertia
6.2.4 Parallel axis theorem
6.2.5 Rotational kinetic energy
6.2.6 Rotational work
6.2.7 Work-energy theorem

7. **Periodic motion**

7.1 Simple harmonic motion
7.1.1 Kinematics
7.1.2 Conditions
7.1.3 Mass on spring
7.1.4 Energy
7.1.5 Simple pendulum
7.1.6 Physical pendulum

8. **Physical optics**

8.1 Conditions for interference of light waves
8.1.1 Coherence
8.1.2 Monochromaticity

8.2 Young's double slit experiment
8.2.1 Conditions for interference
8.2.2 Interference pattern
8.2.3 Intensity distribution
8.2.4 Dependence on initial phase

8.3 Thin films
8.3.1 Phase on reflection
8.3.2 Wedge film

8.4 Diffraction
8.4.1 Single slit diffraction
8.4.2 Intensity pattern
8.4.3 Resolution of apertures

8.5 Diffraction grating
8.5.1 Intensity pattern
8.5.2 Determination of wavelength

Text and materials

Text: Similar to Physics for Scientists and Engineers - Serway

Lab manual
Scientific calculator
Graph paper

It is the policy of the physics department that instructors are not required to give make-up tests. At their discretion , instructors may give make-up tests in the case of documented excuses.